Dissertation on

TO COMPARE THE RECOVERY TIME OF PROPOFOL OR ISOFLURANE IN DAY CASE PROCEDURES.

Dissertation Submitted in partial fulfillment of

M.D. DEGREE EXAMINATION

BRANCH X – ANAESTHESIOLOGY

MADRAS MEDICAL COLLEGE, CHENNAI.

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

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Declaration

I hereby declare that dissertation entitled "**TO COMPARE THE RECOVERY TIME OF PROPOFOL OR ISOFLURANE IN DAY CASE PROCEDURES**", has been prepared by me under the guidance of **PROF.DR.G.SIVARAJAN, M.D., D.A** Professor and Head of Department of Anaesthesiology, Madras Medical College, Chennai in partial fulfillment of the regulations for the award of the degree of M.D. (Anaesthesiology), examination to be held in March 2007.

This study was conducted at Madras Medical College and Government General Hospital, Chennai.

I have not submitted this dissertation previously to any university for the award of any degree or diploma.

Date:
Place: Chennai. Dr. A. Ajay Kumar

CERTIFICATE

This is to certify that the Dissertation "TO COMPARE THE RECOVERY TIME OF PROPOFOL OR ISOFLURANE IN DAY CASE PROCEDURES." presented herein by Dr. A. Ajay Kumar is an original work done in the Department of Anaesthesiology, Madras Medical College and Government General Hospital, Chennai for the award of Degree of M.D. (Branch X) Anaesthesiology under my guidance and supervision during the academic period of 2004-2007.

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INDEX

INTRODUCTION

A surgical procedure performed on a patient admitted and discharged on the same day of surgery is an accepted and well-established practice in modern medicine today. The several names, debated and revised over several years are Day Case, Day Care, Day Surgery, Ambulatory Surgery, 23-hours surgery, and OPD procedures.

The history of Day Care surgery is from time immemorial, as old as medicine itself, changing with the times and needs, to reach the present status. The great surgeon Sushruth has done many of his surgeries probably as day care surgery even before hospitals were well established. The establishment of hospitals and ambulatory units was popularized by Ashoka the Great.

In 1909, Mac Nicoll published a large series of 7000 cases done as Day care procedures. He found that recovery was better in children when they are allowed to recoup at home. Around that time, surgeons and hospital administrators found hospitalization to be more beneficial to patients' recovery, in terms of prevention of post-operative infection. And thus Day care surgery suffered a set back. With the advent of better antibiotics and asepsis, Day Care surgery was revived during the 40's and 50's, but the major bulk of work was done in the 70's and 80's, which permanently established Day Care surgery as part of medical care.

With the invention of better anaesthetic agents, Day surgeries received a much needed boost, where it was found unnecessary to keep the patient back in the hospital.

There were several factors, indigenous to each country, which have encouraged innovations in day surgeries. The Americans introduced medical insurance since the cost of medical care could no longer be borne by average person. The insurance companies forced the medical care specialist to cut costs and made him think and thus, adapt the benefits of Day Care surgery. In U.K., the long wait list, where patients had to wait for several years for surgeries, where National Health Scheme could not cope-up with the work load, Day care solved the problem.

In India, where medical insurance is yet to come up, we find a mixture of both the problems. Day Surgery, which has evolved into an art form, is nowadays being practiced more widely.

The principal arguments in favour of this practice are minimizing cost and making hospital resources available for more number of patients, as each patient spends a shorter period in the hospital. A shorter stay in the hospital also means lesser disruption in the regular activities of the patient and his relatives and lesser chances of nosocomial infections. It also decreases the patients' separation from their familiar home environment making it preferable to the children and elderly.

Ambulatory anaesthesia was conceptualized by Ralph Waters in the early 1900s, and has grown at an exponential rate in the past three decades. Initially the anaesthetic techniques used were regional techniques, but many patients nowadays request for general anaesthesia. Earlier, general anaesthesia drugs had prolonged recovery times making it unsuitable for day case procedures. The availability of shorter acting anaesthetic agents with better recovery profile has made general anaesthesia applicable in day case procedures. The 'clear headedness' of recovery enables the patients to be discharged from the hospital just a few hours after surgery.

Two such drugs found most suitable for this technique are Propofol and Isoflurane. The present study compares the recovery characteristics of these two drugs and their usefulness in ambulatory anaesthesia.

AIM OF THE STUDY

The aim of the study is to compare the recovery times when Propofol or Isoflurane are used for the maintenance of anaesthesia in day case surgery and also to determine which agent is suitable to make the patient home fit at the earliest.

AMBULATORY ANESTHESIA

Today the majority of patients who undergo minor surgery or diagnostic tests do not need to stay overnight in the hospital. In most cases, the patients will be well enough to complete the recovery at home. Ambulatory (or outpatient) anesthesia and surgical care has proven to be safe, convenient and cost-effective and can be performed in a variety of facilities. The surgery may be done in a hospital, a freestanding surgery center or, in some cases, a surgeon's office. Anesthesia care is given or supervised by an anesthesiologist.[4]

Ambulatory anesthesia is tailored to meet the needs of ambulatory surgery so that the patient can go home soon after the operation. Short-acting anesthetic drugs and specialized anesthetic techniques as well as care specifically focused on the needs of the ambulatory patient are used to make the experience safe and pleasant. In general, if the patient is in reasonably good health, he/she is a candidate for ambulatory anesthesia and surgery. After the early recovery from anesthesia, the patient can go home directly. In most cases, family and friends can provide all the needed assistance. Appropriate pain management is included as part of the discharge planning.[1, 4]

There are several types of anesthetic techniques available for ambulatory surgery ranging from local anesthesia to general anesthesia. The anesthetic technique recommended depends on several factors. In some cases, the surgical procedure will dictate what kind of anesthesia will be needed. Based on the medical history, a type of anesthetic may have an additional margin of safety. As an outpatient, some techniques may allow the patient to recover more quickly with fewer side effects. The patients' preferences are also incorporated in the selection of the best anesthetic plan for the procedure.

The four anesthetic options are:

• General anesthesia

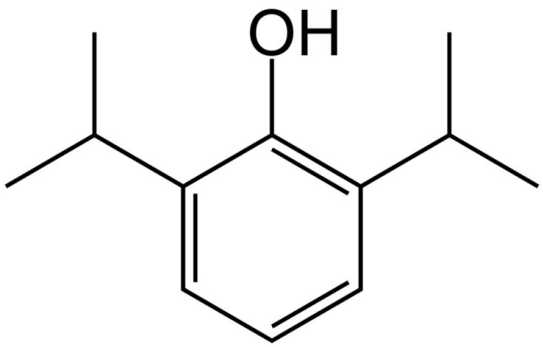
• Regional anesthesia

• Monitored anesthesia care

• Local anesthesia

General anesthesia with regional anesthesia for post operative pain relief is an ideal combination as it combines the advantages of both – the comfort and lack of awareness in the former and the good quality of pain relief with the latter.

PHARMACOLOGY OF PROPOFOL



Propofol[1] is a substituted isopropyl phenol chemically 2,6-diisopropyl phenol. It is administered intravenously as a 1% solution in an aqueous solution of 10% soybean oil, 2.25% glycerol and 1.2% purified egg phosphatide. This drug is chemically distinct from all other drugs that act as Intravenous Sedative Hypnotics. Administration of Propofol 1.5 to 2.5 mg/Kg IV as a rapid intravenous injection (<15secs) produces unconsciousness within about 30 seconds. Awakening is more rapid and complete than that after induction of anaesthesia with all other drugs. The more rapid return of consciousness with minimal residual central nervous system effects is one of the most important advantages of Propofol.

Mechanism of Action:

Propofol is presumed to exert its sedative hypnotic effects through an interaction with GABA, the principal inhibitory neurotransmitter in the central nervous system. When GABA receptor is activated, transmembrane Chloride conductance increases, resulting in hyperpolarisation of the post synaptic cell membrane and functional inhibition of the post synaptic neuron. The interaction of Propofol with specific components of the GABA receptor complex appears to decrease the rate of dissociation of GABA from its receptor, thereby increasing the duration of the GABA activated opening of the Chloride channel with resulting hyperpolarisation of cell membranes.

Pharmacokinetics:

Hepatic metabolism and tissue uptake (possibly into the lungs) are both important in removal of this drug from the plasma. Hepatic metabolism is rapid and extensive, resulting in inactive, water-soluble sulfate and glucuronic acid conjugates that are excreted by the kidneys. The elimination halftime is 0.5 to 1.5 hours, but more important, the context-sensitive half-time for

Propofol infusions lasting up to 8 hours is <40 minutes. The context-sensitive half-time of Propofol is minimally influenced by the duration of the infusion because of rapid metabolic clearance when the infusion is discontinued, such that drug that returns from tissue storage sites to the circulation is not available to retard the decrease in plasma concentrations of the drug.

There is no evidence of impaired elimination in patients with cirrhosis of liver or renal dysfunction.

Volumes of distribution:

Initial apparent (Vol D): 13 to 76 L.

Steady-state (Vol DSS): 171 to 349 L.

Elimination (Vol D): 209 to 1008 L

Pharmacodynamics:

Haemodynamic effects:

Propofol's haemodynamic effects are generally more pronounced than those of other intravenous anaesthetic agents. Arterial hypotension, with readings decreased by as much as 30% or more, has been reported, possibly due to inhibition of sympathetic vasoconstrictor nerve activity. Hypotensive effects are generally proportional to dose and rate of administration of Propofol, and may be potentiated by opioid analgesics. Endotracheal intubation and surgical stimulation may increase arterial pressure. Increases in heart rate and/or blood pressure to greater than baseline values, which occur frequently with other agents, are not as significant with Propofol. This may be due to central sympatholytic and/or vagotonic effects. Propofol may also decrease systemic vascular resistance, myocardial blood flow, and oxygen consumption. The mechanism of these effects may involve direct vasodilation and negative inotropy. Effects such as decreased stroke

volume and cardiac output have been demonstrated in some studies.

Respiratory effects:

Propofol is a respiratory depressant, frequently producing apnoea that may persist for longer than 60 seconds, depending on factors such as premedication, rate of administration, dose administered, and presence of hyperventilation or hyperoxia. In addition, Propofol may produce significant decreases in respiratory rate, minute volume, tidal volume, mean inspiratory flow rate, and functional residual capacity. These respiratory depressant effects may be the result of depression of the central inspiratory drive as opposed to a change in central timing. The ventilatory depressant effects of Propofol may be counteracted by painful surgical stimulation.

Cerebral effects:

Propofol decreases cerebral blood flow, cerebral metabolic oxygen consumption, and intracranial pressure. It also increases cerebrovascular resistance but does not appear to affect cerebrovascular reactivity to changes in arterial carbon dioxide tension.

Other effects:

Preliminary findings suggest that in patients with normal intraocular pressure, Propofol decreases intraocular pressure by as much as 30 to 50%. This decrease may be associated with a concomitant decrease in systemic vascular resistance.

Clinical studies have shown that Propofol does not cause significant signs of histamine release or significant increases in plasma immunoglobulin or complement C 3 levels. Airway resistance after tracheal intubation is lower when Propofol is used for induction of anaesthesia than when Thiopental or high-dose Etomidate is used.

Although Propofol has the potential for affecting adrenal steroidogenesis, it does not appear to block cortisol and aldosterone secretion in response to surgical stress or adrenocorticotropic hormone (ACTH) in clinical practice. Although transient decreases in plasma cortisol concentrations have occurred, these reductions have not been sustained.

Propofol appears to have no analgesic activity. In addition, animal studies have demonstrated no significant effect on coagulation profiles. Limited experience with Propofol in susceptible patients and animal studies has not demonstrated a propensity to induce malignant hyperthermia.

Clinical Uses:

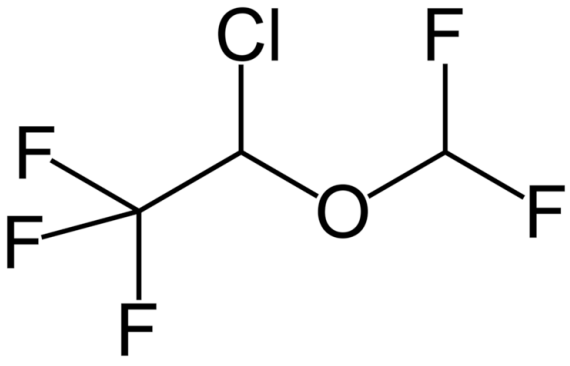
Induction of Anaesthesia:

The induction dose of Propofol in healthy adults is 1.5 to 2.5mg/Kg Intravenous, with blood levels of 2-6µg/mL producing unconsciousness depending on associated medications and the patient's age. Awakening typically occurs at plasma concentrations of 1 to 1.5µg/mL.

Maintenance of Anaesthesia:

The typical dose of Propofol for maintenance of anaesthesia is 100 to 300µg/Kg/Minute I.V, often in combination with a short acting opioid. General Anaesthesia with Propofol is generally associated with minimal Post Operative Nausea Vomiting and awakening is prompt with minimal residual sedative effects.

PHARMACOLOGY of ISOFLURANE



Isoflurane[1] (1-chloro-2, 2, 2-trifluoroethyl difluoromethyl ether) is a halogenated ether used for inhalation anaesthesia.

Physical properties:

-Molecular weight	184.5 g/mol
-Boiling point (at 1 atm):	48.5 °C
-Density (at 25 °C):	1.496 g/mL
-MAC:	1.15 volumes %
-Vapour pressure:	238 mmHg 31.7 kPa (at 20°C)
-Blood: Gas Partition coefficient:	1.4
-Oil: Gas Partition coefficient:	98

Mechanism of Action of Inhaled Anaesthetics[3]

Inhaled anaesthetics act in different ways at the level of the central nervous system. They may disrupt normal synaptic transmission by interfering with the release of neurotransmitters from presynaptic nerve terminal (enhance or depress excitatory or inhibitory transmission), by altering the re-uptake of neurotransmitters, by changing the binding of neurotransmitters to the post-synaptic receptor sites, or by influencing the ionic conductance change that follows activation of the post-synaptic receptor by neurotransmitters. Both, pre- and postsynaptic effects have been found.

Direct interaction with the neuronal plasma membrane is very likely, but indirect action via production of a second messenger also remains possible. The high correlation between lipid solubility and anaesthetic potency suggests that inhalation anaesthetics have a hydrophobic site of action. Inhalation agents may bind to both membrane lipids and proteins. It is at this time not clear which of the different theories are most likely to be the main mechanism of action of inhalation

anaesthetics.

The Meyer-Overton theory describes the correlation between lipid solubility of inhaled anaesthetics and MAC and suggests that anaesthesia occurs when a sufficient number of inhalation anaesthetic molecules dissolve in the lipid cell membrane. The Meyer-Overton rule postulates that the number of molecules dissolved in the lipid cell membrane and not the type of inhalation agent causes anaesthesia. Combinations of different inhaled anaesthetics may have additive effects at the level of the cell membrane.

However, the Meyer-Overton theory does not describe why anaesthesia occurs. Mullins expanded the Meyer-Overton rule by adding the so-called Critical Volume Hypothesis. He stated that the absorption of anaesthetic molecules could expand the volume of a hydrophobic region within the cell membrane and subsequently distort channels necessary for sodium ion flux and the development of action potentials necessary for synaptic transmission. The fact that anaesthesia occurs with significant increase in volume of hydrophobic solvents and is reversible by compressing the volume of the expanded hydrophobic region of the cell membrane supports Mullins Critical Volume Hypothesis.

The protein receptor hypothesis postulates that protein receptors in the central nervous system are responsible for the mechanism of action of inhaled anaesthetics. This theory is supported by the steep dose response curve for inhaled anaesthetics. However, it remains unclear if inhaled agents disrupt ion flow through membrane channels by an indirect action on the lipid membrane, via a second messenger, or by direct and specific binding to channel proteins.

Another theory describes the activation of Gamma-Amino Butyric Acid (GABA) receptors

by the inhalation anaesthetics. Volatile agents may activate GABA channels and hyperpolarize cell membranes. In addition, they may inhibit certain calcium channels and therefore prevent release of neurotransmitters and inhibit glutamate channels. Volatile anaesthetics share therefore common cellular actions with other sedative, hypnotic or analgesic drugs.

The true mechanism of action of volatile anaesthetics may be a combination of two or more such theories described as multisite action hypothesis.

Pharmacokinetics:

Uptake and distribution of inhaled anaesthetics[3]

A series of partial pressure gradients, beginning at the vaporizer of the anaesthetic machine, continuing in the anaesthetic breathing circuit, the alveolar tree, blood, and tissue will ensure the forward movement of the gas. The principal objective of that movement is to achieve equal partial pressures on both sides of each single barrier. The alveolar partial pressure governs the partial pressure of the anaesthetic in all body tissues; they all will ultimately equal the alveolar partial pressure of the gas. After a short period of equilibration the alveolar partial pressure of the gas equals the brain partial pressure. Alveolar partial pressure can be raised by increasing minute ventilation, flow rates at the level of the vaporizer and by using a non-rebreathing circuit.

Two special effects increasing the amount of gas in the alveoli have to be mentioned. The Concentration effect describes how the concentration of the gas in the remaining alveolar volume can increase after some of the gas has been transferred into the blood. The Second gas effect

usually refers to nitrous oxide combined with an inhalation agent. Because nitrous oxide is not soluble in blood, its rapid absorption from alveoli causes an abrupt rise in the alveolar concentration of the other inhalation anaesthetic. All the above mentioned factors influence the inflow of gas into the alveoli.

Solubility, cardiac output, and the alveolar to venous anaesthetic gradient represent outflow factors. Inflow factors minus outflow factors equal alveolar partial pressure of the gas.

Solubility describes the affinity of the gas for a medium such as blood or fat tissue. The blood/gas partition coefficient describes how the gas will partition itself between the two phases after equilibrium has been reached. Isoflurane for example has a blood/gas partition coefficient of 1.4. This means that if the gas is in equilibrium the concentration in blood will be 1.4 times higher than the concentration in the alveoli. A higher blood gas partition coefficient means a higher uptake of the gas into the blood and therefore a slower induction time. It takes longer until the equilibrium with the brain partial pressure of the gas is reached.

A higher cardiac output removes more volatile anaesthetic from the alveoli and lowers therefore the alveolar partial pressure of the gas. The agent might be faster distributed within the body but the partial pressure in the arterial blood is lower. It will take longer for the gas to reach equilibrium between the alveoli and the brain. Therefore, a high cardiac output prolongs induction time.

The alveolar to venous partial pressure difference reflects tissue uptake of the inhaled anaesthetics. A large difference is caused by increased uptake of the gas during the induction phase. This facilitates the diffusion of the gas from the alveoli into the blood.

The brain/blood coefficient describes how the gas will partition itself between the two phases after equilibrium has been reached. Isoflurane for example has a brain/blood coefficient of 1.6 meaning that if the gas is in equilibrium the concentration in the brain will be 1.6 times higher than the concentration in the blood. All inhalation anaesthetics have high fat/blood partition coefficients. This means that most of the gas will bind to fatty tissue as times goes by. The partial pressure of the gas in fatty tissue will rise very slowly. Inhalation anaesthetics stored in such tissue in obese patients may delay awakening at the end of anaesthesia.

Isoflurane shows very low solubility in blood and body tissues. Thus its partial pressure (concentration) in alveolar gas or arterial blood rises to 50% of the inspired partial pressure (concentration) within 4-8 minutes of the start of its inhalation, and to 60% within 15 minutes.

Throughout maintenance of anaesthesia, a high proportion of the Isoflurane inspired is eliminated by the lungs. When administration is stopped and inspired concentration becomes zero, the bulk of the remaining Isoflurane is eliminated unchanged from the lungs. In keeping with its low solubility, recovery from Isoflurane anaesthesia in man is rapid.

Biotransformation of Isoflurane is significantly less than that of Enflurane or Halothane. Humans biotransform a small fraction of Isoflurane administered. In man about 0.2% of the Isoflurane administered, is evident as recoverable metabolites (fluoride and organic fluorine), with approximately 50% of these excreted in the urine, the principal metabolite being trifluoracetic acid.

Enzyme induction associated with pre-existing drug therapy would not appear to be an important factor in the metabolism of Isoflurane in man, mainly because the overall metabolism of Isoflurane is so low.

Dosage and Administration:

Isoflurane has a slight pungent ethereal odour, which may limit the rate of gas induction but, despite this, induction and particularly recovery are rapid. Salivation and tracheo-bronchial secretions may be stimulated in children but pharyngeal and laryngeal reflexes are quickly diminished.

Induction:

As Isoflurane has a mild pungency, inhalation should usually be preceded by the choice of a short-acting barbiturate, or other intravenous induction agent, to prevent coughing. Alternatively, Isoflurane with oxygen or an oxygen/nitrous oxide mixture may be administered. It is recommended that induction with Isoflurane be initiated at a concentration of 0.5%. Concentrations of 1.5-3.0% usually produce surgical anaesthesia in 7-10 minutes. Blood pressure decreases during induction but this may be compensated by surgical stimulation.

Maintenance:

Adequate anaesthesia for surgery may be sustained with an inspired Isoflurane concentration of 1.0% - 2.5% in an oxygen/70% nitrous oxide mixture. Additional inspired Isoflurane (0.5% - 1%) will be required with lower nitrous oxide levels, or when Isoflurane is given with oxygen alone or air/oxygen mixtures. Blood pressure decreases during maintenance anaesthesia in relation to the depth of anaesthesia. That is, blood pressure is inversely related to the

Isoflurane concentration. Provided there are no other complicating factors this is probably due to peripheral vasodilation. Cardiac rhythm remains stable. Excessive falls in blood pressure may be due to the depth of anaesthesia and in such circumstances can be corrected by reducing the inspired Isoflurane concentration.

Recovery:

The concentration of Isoflurane can be reduced to 0.5% at the start of closing the operation wound, and then to 0% at the end of surgery. After discontinuation of all anaesthetics, the airways of the patient should be ventilated several times with oxygen 100% until complete recovery.

TOTAL INTRAVENOUS ANESTHESIA

History:

TIVA[2] was first conducted by a French man Pierre Oré in Lyons in 1874 to investigate the effects of anaesthesia induced with intravenous Chloral. The incidence of morbidity was unacceptable and the technique fell into disrepute. In 1932, intravenous anaesthesia became a serious prospect following the introduction of Hexobarbitone and Thiopentone, first used by Ralph Waters, but reported initially by John Lundy. Methohexitone appeared in 1956 and has been described as a sole agent for both induction and short term maintenance of anaesthesia. Propanidid, Althesin and Etomidate were also tried but are no longer available for human use. Ketamine was the first drug designed specifically for TIVA; although it fell into disrepute because in high doses it produced psycho mimetic effects.

Because of its favourable pharmacokinetic and pharmacodynamic profile, Propofol has become the most widely used intravenous anaesthetic for TIVA. Although many of the published studies have combined Propofol with Alfentanyl because of the perceived pharmacokinetic advantages of the latter over Fentanyl, Propofol can be combined with any Opioid.

Infusion schemes for Intravenous Anaesthesia: [2]

The general principles of intravenous anaesthesia can be summarized:-

1. The induction dose of an intravenous anaesthetic agent should be sufficient to ensure that the patient loses consciousness, but not so great as to cause undesirable side effects such as arterial hypotension and bradycardia or tachycardia.
2. The maintenance infusion scheme should allow a predetermined arterial blood concentration of the drug, sufficient to achieve adequate surgical anaesthesia, to be achieved as quickly as possible and maintained reasonably constant at the early part of anaesthesia up to the surgical incision.
3. The maintenance infusion scheme must also be capable of alteration to decrease or increase the arterial blood concentration of the drug to match the requirements of continuing surgery.

SCHEMES:

Infusion schemes to achieve stable blood concentrations of intravenous drugs fall into four categories.

1. Zero-order infusions: Continuous infusions at a fixed rate.
2. Ramp infusion: Designed to have a constantly increasing rate of infusion for short periods of time.
3. Computer controlled infusions: Designed to achieve either a constant blood concentration or a constant brain concentration.

4. Manually controlled infusions: Stepped infusions to simulate the behaviour of a computer controlled infusion.

   In this study, manually controlled stepped infusions were used.

MANUALY CONTROLLED STEPPED INFUSION SCHEMES

Roberts et aldevised a simple stepped scheme in which a loading dose was followed by three stepped infusions designed to simulate the exponential decrease of the infusion rate in the BET scheme. This scheme is very simple to operate, requires no computer, and apart from minor deviations within the first 20 minutes of the infusion, produces predictable blood Propofol concentrations.

Staged Recipes Propofol TIVA [2, 14]

Propofol:

–Initial bolus 2mg/kg IV

–12 mg/kg/h x 10 min (200 mcg/kg/min)

–10 mg/kg/h x 20 min (167 mcg/kg/min)

–8 mg/kg/h x 1 h (133 mcg/kg/min)

–6 mg/kg/h maintenance (100 mcg/kg/min)

– (awareness at 18 mcg/kg/min)

Add Narcotic bolus or infusion of choice.

TARGET CONTROLLED INFUSION

Progress in computing technology has allowed the development of target controlled infusion devices, with drugs delivered to achieve specific predicted target blood drug concentrations. Target controlled infusion (TCI) system has been found to be ideal for the administration of Propofol for

TIVA. A set of pharmacokinetic parameters is selected using computer simulation of a known infusion scheme. The selected model is incorporated into a computer-compatible infusion pump.

Clinical trials with such systems have provided appropriate target concentrations for the administration of target controlled infusion of anaesthetic drugs. Nowadays TCI technology is becoming a part of routine anesthesia technique especially in intravenous anesthesia. Besides clinical application in anesthesia, target controlled systems are also being researched for the administration of sedative and analgesic drugs in the peri-operative period.

Laryngeal Mask Airway

The laryngeal mask airway (LMA) [5] is a supra glottic airway device used in anaesthesia and in emergency medicine for airway management. It was invented in the 1980s by British anaesthetist, Dr. Archie Brain. It is a tube with an inflatable cuff that is inserted into the pharynx. It sits tightly over the top of the larynx. Post operatively it causes less pain and coughing than an endotracheal tube. However, it does not protect the lungs from aspiration, making it unsuitable for anybody at risk of this complication

The laryngeal mask airway avoids tracheal intubation and can be used with spontaneous respiration or artificial ventilation. It has found favour in day case surgery.

Clinical benefits:

- More secure than a face mask
- Allows single-handed ventilation
- Rapid, blind insertion (no laryngoscopy)

Indications:

- Routine and emergency anaesthetic procedures

- Known or unexpected difficult airways
- Establishing an airway during resuscitation in the profoundly unconscious patient with absent glossopharyngeal and laryngeal reflexes when tracheal intubation is not possible

Contraindications:

- Patients who are not fasted or where fasting cannot be confirmed
- May have retained gastric contents
- Have fixed decreased pulmonary compliance

TECHNIQUE OF LMA INSERTION

Before insertion:-

- Step 1: Size selection
- Step 2: Examination of the LMA
- Step 3: Check deflation and inflation of the cuff
- Step 4: Lubrication of the LMA
- Step 5: Position the Airway

STEP I – Size selection

- To verify that the size of the LMA is correct for the patient
- Recommended Size guidelines:

• Size 1:	• under 5 kg
• Size 1.5:	• 5 to 10 kg
• Size 2:	• 10 to 20 kg
• Size 2.5:	• 20 to 30 kg
• Size 3:	• 30 kg to small adult
• Size 4:	• adult
• Size 5:	Large adult/poor seal with size 4

STEP II - Examination of the LMA

- The LMA is visually inspected for cuff tears or other abnormalities.

- The shaft is checked to ensure that it is free of blockage or loose particles
- Next the cuff is checked by deflating to ensure that it will maintain a vacuum and inflating to ensure that it does not leak

STEP III - Checking deflation and inflation of the cuff

- The cuff is slowly deflated to form a smooth flat wedge shape which will pass easily around the back of the tongue and behind the epiglottis.
- During inflation the maximum air in cuff should not exceed:

• Size 1:	• 4 ml
• Size 1.5:	• 7 ml
• Size 2:	• 10 ml
• Size 2.5:	• 14 ml
• Size 3:	• 20 ml
• Size 4:	• 30 ml
• Size 5:	• 40 ml

STEP IV - Lubrication of the LMA

- A water soluble lubricant is used to lubricate the LMA just prior to insertion.
- The back of the mask is thoroughly lubricated.
- An excessive amount of lubricant on the anterior surface of the cuff or in the bowl of the mask is avoided as inhalation of the lubricant following placement may result in coughing or obstruction.

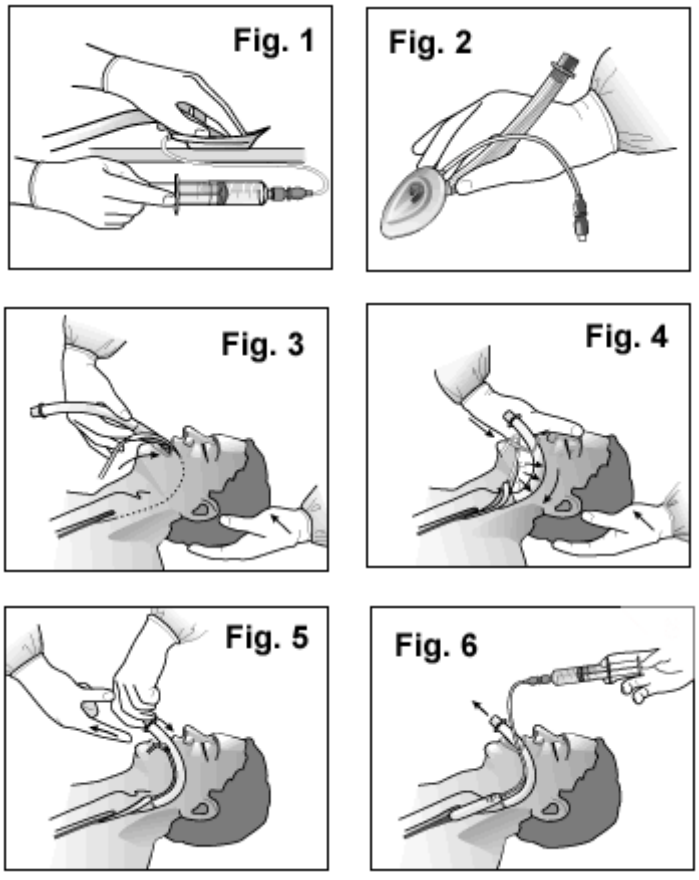
STEP V - Positioning the Airway

- The head is extended and the neck flexed.

LMA Insertion

The LMA is grasped by the tube, holding it like a pen as near as possible to the mask end. The tip of the LMA is placed against the inner surface of the patient's upper teeth and under direct vision; the mask tip is pressed upwards against the hard palate to flatten it out. The index finger keeps pressing upwards as the mask is advanced into the pharynx to ensure the tip remains flattened and avoids the tongue. Keeping the neck flexed and head extended, the mask is pressed into the posterior pharyngeal wall using the index finger.

Continuous pushing with the index finger guides the mask downward into position. The tube is grasped firmly with the other hand before withdrawing the index finger from the pharynx. Pressing gently downward with the other hand ensures that the mask is fully inserted. Next, the mask is inflated with the recommended volume of air.



One should avoid over-inflating the LMA as it can result in loss of seal. It is preferable not touch the LMA tube while it is being inflated unless the position is obviously unstable. Normally the mask rises up slightly out of the hypopharynx as it is inflated to find its correct position.

Verification of placement of the LMA

The LMA is connected to a Bag-Valve Mask device or low pressure ventilator. The patient is ventilated while confirming equal breath sounds over both lungs in all fields and the absence of ventilatory sounds over the epigastrium.

Securing the LMA

A bite-block or roll of gauze is inserted to prevent occlusion of the tube should the patient bite down. Now the LMA is secured utilizing the same techniques as those employed in the securing of an endotracheal tube.

Problems with LMA Insertion

Failure to press the deflated mask up against the hard palate or inadequate lubrication or deflation can cause the mask tip to fold back on itself. Once the mask tip has started to fold over, this may progress, pushing the epiglottis into its down-folded position causing mechanical obstruction.

If the mask tip is deflated forward it can push down the epiglottis causing obstruction.

If the mask is inadequately deflated it may either push down the epiglottis or penetrate the glottis.

Assessment of Recovery and Home Readiness

For any day care procedure, the assessment of recovery is of paramount significance. A discrete time interval is no longer considered crucial for discharge; however, the patient must achieve clinical criteria that clearly reflect passage through the phases of early and intermediate

recovery. The new short acting anaesthetics and analgesics have been instrumental in the faster patient recovery now seen after surgery. Some patients are now being transferred directly from the operating table to the step-down unit (Phase 2 recovery), bypassing the PACU. This process is known as 'fast-tracking'.[1]

Stages of Recovery:

There are three stages of recovery following ambulatory surgery, namely, Early, Intermediate and Late. Early and intermediate recovery stages occur in the ambulatory surgical facility, whereas late recovery refers to the resumption of normal daily activities and occurs after discharge.

Early recovery is the time interval during which patients emerge from anaesthesia, recover their protective reflexes and resume motor activity. During this phase of recovery, patients are cared for in a Phase I Post Anaesthesia Care Unit (PACU), where their vital signs and oxygen saturation are carefully monitored and supplemental oxygen, analgesia or antiemetics may be administered. The Aldrete score is commonly used to assess the fitness of patients to be transferred to the Phase II recovery area.

Postanaesthesia Recovery Score (Aldrete Score)

ACTIVITY

2=Moves all extremities voluntarily or on command

1=Moves two extremities

0=Unable to move extremities

RESPIRATION

2=Breathes deeply & coughs freely

1=Dyspneic

0=Apneic

CIRCULATION

2=BP ± 20mm of preanaesthetic level

1=BP ± 20 to 50mm of preanaesthetic level

0=BP ± 50mm of preanaesthetic level

CONSCIOUSNESS

2=Fully awake

1=Arousable on calling

0=Not responding

OXYGEN SATURATION

2=SpO2 > 92% on room air

1=Supplemental O2 req to maintain SpO2>92%

0=SpO2 < 92% with O2 supplementation

Total score=10 (≥ 9 for PACU Bypass)

The late recovery period starts when the patient is discharged home and continues until full, functional recovery is achieved and the patient is able to return to work. The surgical procedure itself has the highest impact on the full functional recovery.

Fast Tracking:

The availability of rapid and short acting anaesthetic drugs for the maintenance of General Anaesthesia has facilitated the early recovery of outpatients after ambulatory surgical procedures. Patients may be completely awake and oriented, breathing comfortably, with stable vital signs at

the time they leave the operating theatre after brief ambulatory surgical procedures done under General Anaesthesia. Significant cost savings may be achieved by bypassing the PACU – Personnel are the major cost of the PACU.

Assessment of Home Readiness:

Guidelines for safe discharge from ambulatory surgical facility include stable vital signs, return to baseline orientation, ambulation without dizziness, minimal pain and PONV, and minimal bleeding at the surgical site. All ambulatory surgical patients must have an escort to transport them home, and they must receive written post operative instructions including advice on whom to contact in case a problem develops.

Causes of delay in discharge:

Delays in discharge are typically related to persistent symptoms such as pain, PONV, dizziness, unsteady gait or, frequently, the lack of an escort. Excessive pain post operatively is a common surgery related cause of delayed discharge. Planning an appropriate prophylactic analgesic helps to eliminate the delay due to inadequate post operative pain relief.

PADSS (Post Anaesthesia Discharge Scoring System)

A discharge scoring system has been developed to evaluate and document patients' readiness for discharge objectively. The PADSS is a simple cumulative index that measures patients' home readiness and is based on five major criteria namely vital signs, activity, nausea & vomiting, pain and surgical site bleeding.

A maximum score of 10 is possible. Patients achieving a score of 9 or greater and have a responsible adult escort are considered fit for discharge. The requirement of patients to drink and void prior to discharge may not be necessary.

(Modified PADSS) [1]

<u>VITAL SIGNS (BP & PR)</u>

2=Within 20% of preoperative baseline

1=20% to 40% of preoperative baseline

0=>40% of preoperative baseline

AMBULATION

2=Steady gait, no dizziness, or preoperative level

1=Requires assistance

0=Unable to ambulate

NAUSEA & VOMITING

2=Minimal: treated with PO medication

1=Moderate: treated with IM medications

0=Continuous after repeated treatment

PAIN

Acceptable to pt; controlled with PO meds

2=Yes

1=No

SURGICAL BLEEDING

2=Minimal: no dressing change required

1=Moderate: up to two dressing changes

0=Severe: more than three dressing changes

Maximum score= 10 (≥ 9 required for discharge)

REVIEW OF LITERATURE

1. Ebert, Thomas J., M.D., Ph.D.; Robinson, Brian J., Ph.D.s ; Uhrich, Toni D., M.S.s; Mackenthun, Arden, Ph.D.s; Pichotta, Philip J.(1996), did a study comparing Isoflurane and Propofol Anaesthesia. They found that the time to recovery with Propofol was much sooner than Isoflurane.

2. Rowbotham, D. J.; Peacock, J. E.; Jones, R. M.; Speedy, H. M.; Sneyd, J. R.; Morris, R. W.; Nolan, J. P.; Jolliffe, D.; Lang, G. (1996) did a study comparing Isoflurane and Propofol for short-stay surgical procedures. They found that times to spontaneous respiration, adequate respiration and tracheal extubation were significantly shorter in Isoflurane group compared with Propofol group.

3. A. Moffat, MB, CHB, FRCA, P. M. CULLEN, MB, CHB, DRCOG, FRCA, Department of Anaesthetics, Western Infirmary, Dumbarton Road, Glasgow (1994) did a study comparing Isoflurane and Propofol general anaesthesia for day-case cataract surgery in 40 patients more than 60 yr of age. They found that isoflurane anaesthesia appeared to be superior to propofol in this age group as it was associated with less hypotension and a more rapid recovery.

4. Dexter, Franklin, M.D., Ph.D.; Tinker, John H., M.D. (1995) did a study comparing Desflurane, Isoflurane or Propofol on time to following commands and time to discharge. They found that there are only minor clinically important differences between desflurane and isoflurane or propofol with respect to time to following commands and time to discharge.

5. Ashworth, Julie, MB BS, FRCA; Smith, Ian, BSc, MB BS, FRCA (1998) did a study comparing

Desflurane with Isoflurane or Propofol in spontaneously breathing ambulatory patients. They concluded that neither desflurane nor propofol offered any major advantages over Isoflurane.

6. Chung, Frances, MD FRCPC (1995) did a study and concluded that the Post-Anaesthesia Discharge Scoring System (PADSS) is simple, practical, easy to apply and to remember. In addition to permitting a uniform assessment of home readiness for patients, PADSS establishes a pattern of routine, repetitive evaluation of patients home readiness that is likely to contribute to improved patient outcome.

7. Larsen LE, Gupta A, Ledin T, Doolan M, Linder P, Lennmarken C. of Department of Anaesthesiology, University Hospital, Linkoping, Sweden (1992) did a study comparing recover time to optimal performance of psychomotor tests following anaesthesia with Propofol TIVA and Isoflurane maintenance. They concluded that the recovery with Propofol was much better.

8. Moussa AM, Geaisa KN of Faculty of Medicine, Ain Shams University (1992) did a study comparing TIVA using propofol and conventional thiopentone/isoflurane/nitrous oxide technique. They concluded that TIVA using propofol is preferred technique due to its faster and better quality of recovery.

9. Anil Gupta, MD FRCA, PhD , Tracey Stierer, MD, Rhonda Zuckerman, MD, Neal Sakima, MD, Stephen D. Parker, MD, and Lee A. Fleisher, of Department of Anesthesiology and Critical Care, and the Division of Ambulatory Surgery, Johns Hopkins Medical Institutions, Baltimore, Maryland and the Division for Ambulatory Surgery, Department of Anaesthesiology, University Hospital, Örebro, Sweden (2002) did a study comparing various techniques used in day case surgeries. No

differences were found between propofol and isoflurane in early recovery. Nausea, vomiting, headache, and postdischarge nausea and vomiting incidence were in favour of propofol compared with Isoflurane.

10. Molloy, Mary E, Buggy, Donal J, Scanlon, Patrick (1999) did a study and concluded that LMA is ideal for short day case surgeries as long as the lithotomy position is not used.

11. Figueredo, Eduardo, MD,; Vivar-Diago, Miguel, MD,; Muñoz-Blanco, Francisco, MD, (1998) did a study comparing spontaneous and controlled ventilation using LMA and concluded that spontaneous ventilation is associated with lesser post operative throat discomfort.

12. Keller, C., MD; Sparr, H. J., MD; Luger, T. J., MD; Brimacombe, J, MB CHB FRCA MD (1998) Patient outcome is similar for SV and PPV in non-paralysed adult patients with the LMA.

13. Vincent, Robert D., Jr., M.D.; Syrop, Craig H., M.D.; VanVoorhis, Bradley J., M.D.; Chestnut, David H., M.D.; Sparks, Amy E.T., Ph.D.; McGrath, Joan M., M.D.; Choi, Won W., M.D.; Bates, James N., M.D. Ph.D.; Penning, Donald H., M.D.(1994) did a study comparing Propofol with Isoflurane and concluded that the time to recovery were the same but quality was better with Propofol and nausea more with Isoflurane.

14. Boldt, Joachim, MD; Jaun, Norbert, MD; Kumle, Bernhard, MD; Heck, Martin, MD; Mund, Klaus, MD (1997) did a study and concluded that Propofol has better recovery than Isoflurane.

15. Juvin, Philippe, MD; Servin, Frédérique, MD; Giraud, Olivier, MD; Desmonts, Jean-Marie,

MD(1997) did a study comparing Desflurane with Propofol and Isoflurane in old patients. They concluded that the recovery profiles were similar with Desflurane offering a minor advantage.

16. Sear, J. W.; Glen, J. B.(1994) did a study and concluded that weight corrected Propofol dosage produces stable plasma Propofol concentrations sufficient for uneventful surgery.

MATERIALS AND METHODS

This study was carried out in the General Surgery theatre, Government General Hospital, Chennai after obtaining institutional approval. The aim of the study was to compare the Phase I and Phase II recovery times when Propofol or Isoflurane are used for the maintenance of anaesthesia in day case procedures and also to determine which agent is suitable to make the patient street fit at the earliest.

STUDY DESIGN

The study was a randomized prospective study.

SELECTION OF CASES

Forty patients undergoing Day Case surgeries in the Head, Breast or Upper limb were selected for the study. Their age ranged from 18 to 47years. All the patients were assessed and those with normal clinical, biochemical radiological and haematological parameters were selected. Informed written consent was obtained from all the patients. Each patient was randomly allocated to either the Propofol or the Isoflurane group by lots. The groups were named ‘P’ for Propofol and ‘I’ for Isoflurane.

INCLUSION CRITERIA

Assessed patients of ASA physical status I & II

Normal biochemical and haematological parameters

Age group between 18 to 50 years

ASA class I, II

No known hypersensitivity to eggs or sulpha drugs

Airway MPC 1, 2 and 3

Minor surgeries of head, neck, breasts and upper limb

Surgery lasting less than 90 minutes duration

Patients normally able to ambulate well

Educated attender who can understand and carryout instructions

EXCLUSION CRITERIA

Patient not willing

ASA class III and above

Known hypersensitivity to eggs or sulpha allergy

Airway MPC IV

Major surgeries requiring overnight hospital stay

Surgeries near or involving the airway

Patient having difficulty in walking

No attender or attender not educated enough to carryout instruction

MATERIALS:

1. Boyles machine with Isoflurane vaporizer
2. Syringe infusion pump
3. Appropriate drugs in labelled preloaded syringes
4. Appropriate sized Laryngeal Mask Airways
5. Functioning Laryngoscope with appropriate size blades
6. Appropriate sized Endotracheal tubes

7. Equipment and drugs for resuscitation
8. Suxamethonium for emergency use in airway control

METHODS:

Pre-operative preparation

Patients were assessed pre-operatively, procedure was explained to the patient and informed consent obtained. They were assessed with particular attention for any contraindications. The tests for recovery and the importance of strictly following instructions were emphasized.

Premedication:

All the patients received Glycopyrrolate 5µg/Kg premedication and Fentanyl 2µg/Kg analgesia fifteen minutes before induction.

Conduct of anesthesia:

On arrival of the patient in the operating room, monitors like pulseoximetry, Non invasive BP and ECG were connected and baseline values of HR, BP and SpO2 were recorded. An intravenous access was obtained in the nondominant arm.

Both the groups were induced with Propofol 2mg/Kg I.V. An appropriate sized Laryngeal Mask Airway was introduced and its correct position confirmed. No muscle relaxants were used. In case of any movement by the patient, an additional bolus of Propofol 0.5mg/Kg was given.

PROPOFOL GROUP:

Immediate post induction, this group of patients received a continuous infusion of Propofol from a syringe pump.(B Braun Melsungen 'S' series) according to the following scheme:-

–12 mg/kg/h x 10 min (200 mcg/kg/min)

–10 mg/kg/h x 20 min (167 mcg/kg/min)

–8 mg/kg/h x 1 h (133 mcg/kg/min)

–6 mg/kg/h maintenance (100 mcg/kg/min)

In addition, they were connected to the Bain breathing circuit with 66% Nitrous oxide and 33% Oxygen. The patient spontaneously ventilated throughout the procedure. Any spontaneous movement was tackled with a 20mg bolus of Propofol.

ISOFLURANE GROUP:

Immediate post induction, this group received Isoflurane (Penlon Sigma Delta vaporizer) in 66% Nitrous oxide and 33% Oxygen through the Bain breathing circuit. The percentage of Isoflurane was titrated in 0.2% increments or decrements according to patient response. The patients were allowed to ventilate spontaneously. An increase in the depth of respiration warranted an increase in Isoflurane concentration and vice versa.

Monitoring:

Throughout the procedure, Non invasive BP and HR were monitored every 5 minutes; ECG and SpO2 were monitored continuously till recovery.

Recovery:

In both groups, the maintenance agent was discontinued once the last skin suture was in place. The time of discontinuing the agent was taken as 'time zero' to calculate the recovery times. The time till Aldrete score becomes ≥9 is taken as the time to Phase I recovery. The time till PADSS score ≥9 is taken as the time to Phase II recovery and home readiness.

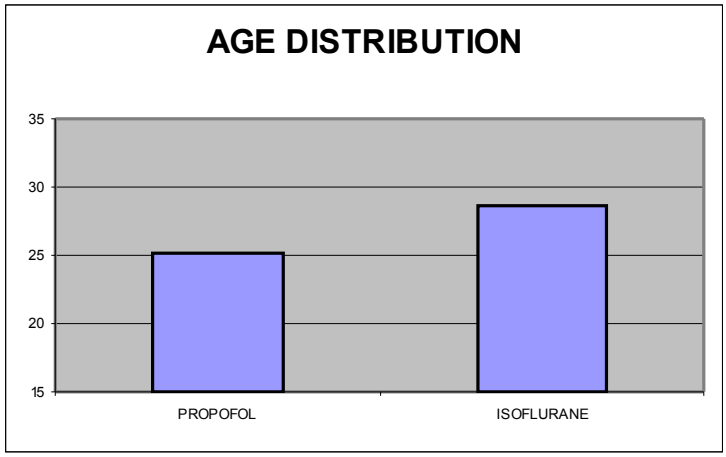
Parameters Studied:

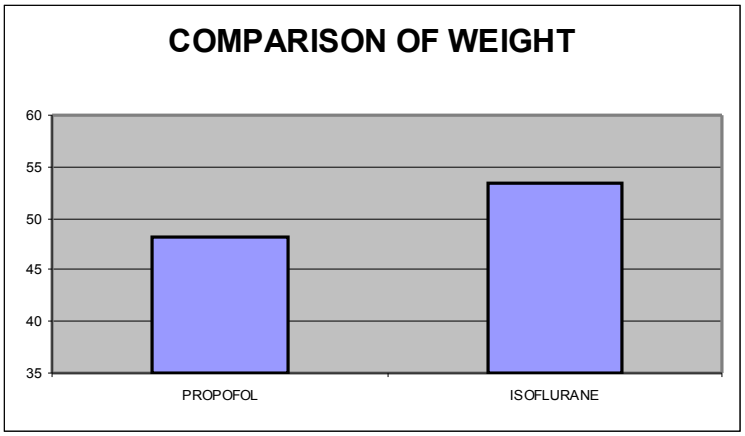
TIME TO PHASE I RECOVERY:

This is the time taken from discontinuation of Propofol or Isoflurane to the time when the Aldrete score is ≥ 9.

TIME TO PHASE II RECOVERY:

This is the time taken from discontinuation of Propofol or Isoflurane to the time when the PADSS score is ≥ 9. It is also taken as the time to Home readiness.





OBSERVATION AND RESULTS:

The patients included in the study were divided into two groups consisting of 20 patients each.

Group P (n = 20) received Propofol maintenance

Group I (n = 20) received Isoflurane maintenance

Table 1

Mean age (in years) in both the groups studied

Group	n	Mean (years)	SD	Result
Group P	20	25.2	6.96	NS*
Group I	20	28.6	10.3	

* – Not Significant

The two groups were similar with respect to age, the difference was not statistically significant.

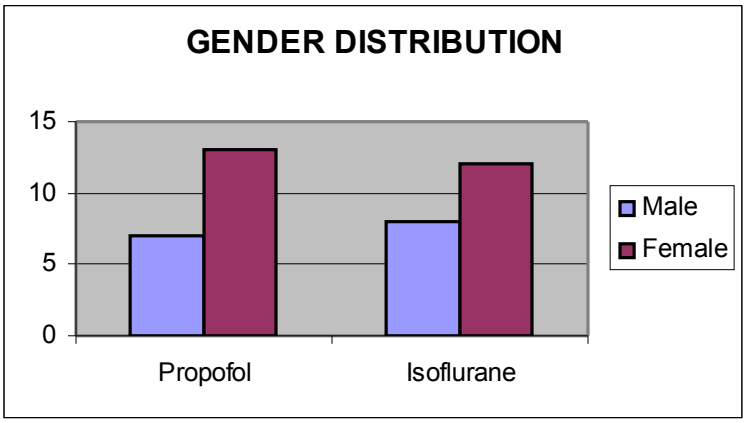
Table 2

Mean weight (Kg) in both groups studied

Group	n	Mean (Kg)	SD	Result
Group P	20	48.25	12.06	NS*
Group I	20	53.5	10.53	

* – Not Significant

There was no statistically significant difference between the two groups as regards weight distribution.



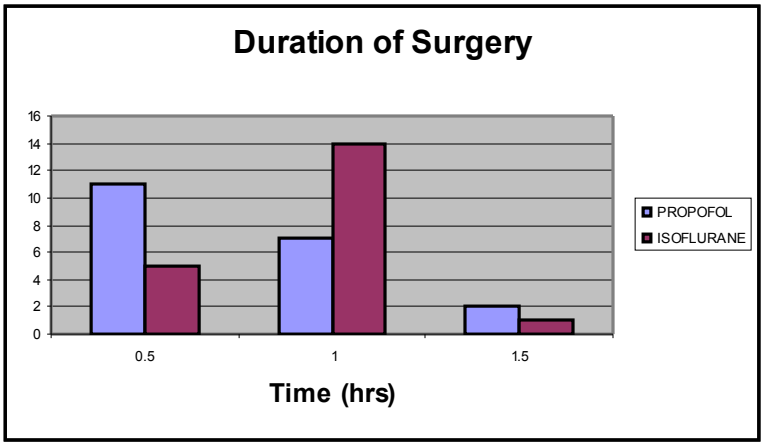


Table 3

Sex distribution in both the groups studied

Sex	Group P	Group I	Result
Male	7	8	NS*
Female	13	12	

* – Not Significant

There was no statistically significant difference between the two groups as regards sex distribution.

Table 4

Duration of surgery (mins)

Group	n	Mean (mins)	SD	Result
Group P	20	39.25	16.49	NS*
Group I	20	41.25	12.23	

* – Not Significant

There was no statistically significant difference in duration of surgery between the twogroups

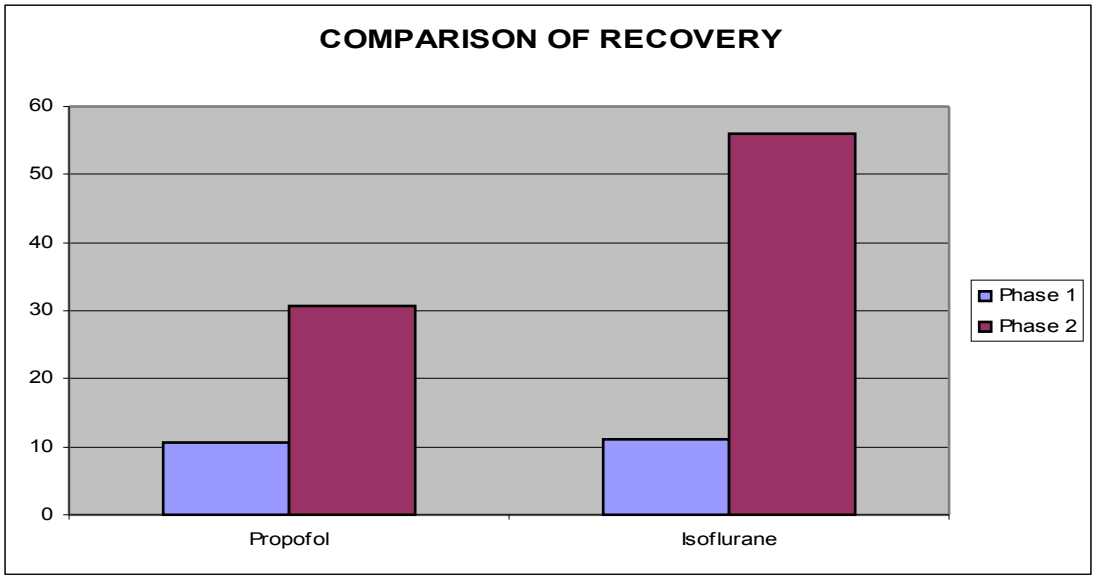


Table 5

Time to Phase I recovery

Group	n	Mean (mins)	SD	Result
Group P	20	10.7	2.89	NS*
Group I	20	11	2.15	

* – Not Significant

The time up to Phase I recovery was not statistically significant between the two groups.

Table 6

Time to Phase II recovery

Group	n	Mean (mins)	SD	Result
Group P	20	30.75	8.78	P < 0.01
Group I	20	56	22.69	

P < 0.05 – Significant

P < 0.01 – Highly significant

There was a statistically significant difference in the time up to 'Home readiness' between the two groups. The time up to Phase II recovery was significantly shorter with Propofol than with Isoflurane.

DISCUSSION

Anaesthesia for Day surgery demands high-quality anaesthesia, maximal safety, minimal side-effects and rapid recovery. These requirements may point to local or regional anaesthesia as a first choice when feasible. However, when general anaesthesia is required, as is often the case, the characteristics of the ideal anaesthetic technique are that induction should be rapid and swift, maintenance should be physiologically stable with readily adjustable anaesthetic depth, and the recovery should be rapid and complete, allowing early return to normal activities.

Propofol is a short-acting intravenous anaesthetic agent used for the induction as well as maintenance of general anaesthesia. Awakening is more rapid and complete than that after induction of anaesthesia with all other drugs.[1, 2, 3]

With Propofol anaesthesia, the laryngeal reflexes are stable which aids in using the Laryngeal Mask Airway. This has popularised the use of the Laryngeal Mask Airway in these patients.[3] LMA requires a lower level of depth of anaesthesia and the incidence of post operative sore throat is very low when compared with tracheal intubation.

The more rapid return of consciousness with minimal residual central nervous system effects is one of the most important advantages of Propofol.

Isoflurane is a very stable inhalational agent and shows very low solubility in blood and body tissues. It undergoes minimal metabolism and is largely eliminated unchanged through the lungs. Throughout maintenance of anaesthesia, a high proportion of the Isoflurane inspired is eliminated by the lungs. Because of its low solubility, recovery from Isoflurane anaesthesia in man is rapid.[3] LMA is preferred over Tracheal tube for GA in Day care patients.

Joshi,[16] Girish P., MB BS, MD, FFARCSI; Inagaki, Yoshimi, MD et al; Molloy, Mary E, Buggy, Donal J, Scanlon, Patrick in their study on using the Laryngeal Mask Airway concluded that it is ideal for Daycase anaesthesia. Figueredo,[15] Eduardo, MD,; Vivar-Diago, Miguel, MD,; Muñoz-Blanco, Francisco, MD, found that post operative throat discomfort following anaesthesia using laryngeal mask depends on the type of ventilation. Spontaneous ventilation causes less discomfort than controlled ventilation. McCrory,[17] Connail R., MB FFARCSI; McShane, Alan J., BSC FRCPI FFARCSI in a study comparing non premedicated and premedicated patients in ambulatory surgery, concluded that reflux of gastric contents occurs only in non premedicated patients. With adequate premedication, reflux or micro aspiration did not occur.

The use of Laryngeal mask airway for our study was based on the above studies.

Recovery following Propofol was not dependent on the time duration of surgery. In contrast, with Isoflurane, the recovery was prolonged after long duration surgeries as noted by Ebert,[7] Thomas J., M.D., Ph.D.; Robinson, Brian J., Ph.D.; Uhrich, Toni D., M.S.; Mackenthun, Arden, Ph.D.; Pichotta, Philip J., B.S. in their study. This may be explained by the mechanism of recovery from either of these drugs. In Propofol, though redistribution occurs, the major reason for the rapid recovery is rapid metabolism. Even in prolonged infusions, rapid metabolic clearance when the infusion is discontinued ensures that drug that returns from tissue storage sites to the circulation is not available to retard the decrease in plasma concentrations of the drug. In contrast, Isoflurane undergoes negligible metabolism and all the inhaled agent must exit via the lungs. In prolonged anaesthesia with higher concentrations, accumulation of Isoflurane can occur in the adipose tissues leading to possible delayed recovery. To overcome this confounding factor, we chose short procedures lasting not more than 90 minutes in the study.

Target Controlled Infusions which use computer programmes to predict the plasma

concentrations are the best method to infuse Propofol for TIVA. But the algorithms used in these pumps are based on the Caucasian race and may not be applicable in our patients. Manual stepped infusions are a simple yet effective alternate method to infuse Propofol for TIVA. Sear, J. W.; Glen, J. B.[14] in their study found that manual stepped infusions of Propofol based on patient weight were able to produce adequate plasma Propofol levels and uneventful surgery. This was the basis of using stepped infusions in our study. Even with the stepped infusions, some of the patients had involuntary movements requiring bolus doses of Propofol.

In this study we found that the home readiness following Propofol TIVA was earlier than Isoflurane. This is in concurrence with the study by Boldt,[11] Joachim, MD; Jaun, Norbert, MD; Kumle, Bernhard, MD; Heck, Martin, MD; Mund, Klaus. Ebert,[7] Thomas J., M.D., Ph.D.; Robinson, Brian J., Ph.D.; Uhrich, Toni D., M.S.; Mackenthun, Arden, Ph.D.; Pichotta, Philip J., B.S. compared the recovery of Propofol, Isoflurane and Sevoflurane. They found a quicker recovery with Propofol (86.4 mins) when compared to Isoflurane (101.5 mins). The longer `recovery times in comparison to our study may be due to the longer duration of surgery (>120 mins). Dexter,[10] Franklin, M.D., Ph.D.; Tinker, John H., M.D. also found Propofol to be better.

Vincent, Robert D., Jr., M.D.; Syrop, Craig H., M.D.; VanVoorhis, Bradley J., M.D.; Chestnut, David H., M.D.; Sparks, Amy E.T., Ph.D; McGrath, Joan M., M.D.; Choi, Won W., M.D.; Bates, James N., M.D. Ph.D.; Penning, Donald H., M.D. found no appreciable difference between Propofol and Isoflurane in their study with regards to duration. But the incidence of Post operative nausea vomiting was minimal with Propofol. Hence the quality of recovery was better with Propofol. Ashworth[9], Julie, MB BS, FRCA; Smith, Ian, BSc, MB BS, FRCA too found Propofol to be no better than Isoflurane with respect to recovery.

Juvin,[12] Philippe, MD; Servin, Frédérique, MD; Giraud, Olivier, MD; Desmonts, Jean-Marie, MD found Propofol and Isoflurane to have same recovery times in older people and attributed this to the lipid solubility of Propofol and the higher percentage of body fat in this group of patients.

Rowbotham,[18] D. J.; Peacock, J. E.; Jones, R. M.; Speedy, H. M.; Sneyd, J. R.; Morris, R. W.; Nolan, J. P.; Jolliffe, D.; Lang, G. found that recovery was more rapid in the Isoflurane group, although clinically the difference was insignificant. Nausea was more frequent in the Isoflurane group than Propofol group but there was no difference in the incidence of emesis. Moffat, [6] A.; Cullen, P. M. too found recovery from Isoflurane to be quicker than Propofol. But in this study it was noted that Propofol group has a better recovery than the Isoflurane group.

Though my study took into account only the time duration till recovery, the quality of recovery was much better with Propofol. The incidence of Post Operative Nausea and Vomiting, one of the most distressing after effects of General Anaesthesia was nil when Propofol was used as maintenance agent. Isoflurane has some analgesic properties. But since a potent opioid like Fentanyl was used and since the surgeries were ‘minor’, this property of Isoflurane did not have any impact on the results.

One important aspect not considered in this study is the cost factor.[8] This is next to impossible to analyse because the study is conducted in a Government institution where the patient care is totally free. All the drugs are provided free of cost to the patient. Many studies comparing the costs of the Propofol and Isoflurane conclude in favour of Isoflurane. But they don’t compare the overall cost of high dependency unit stay, qualified personnel and the drug cost to control PONV.

SUMMARY

Early recovery of psychomotor functions and fewer postoperative side effects, such as nausea and vomiting, leads to earlier discharge from the PACU and from the hospital. The use of a TIVA regimen may be an important step toward fast-track eligibility and shortening of PACU stay. This may result in increased efficacy in busy surgical centers. The anesthetic depth was similar both in the propofol group and the Isoflurane group. Occasionally Propofol was associated with some purposeful movements but was not significant enough to delay surgery. Similar problems have been reported previously with Propofol in some studies. These are probably related to the complex relationship between the delivered concentration over time and the resultant blood levels. It may also be due to the wide variability in patient responses at a given plasma concentration of Propofol. This explains the requirement for bolus administration in some of our patients.

In spontaneously breathing patients, inadequate anesthesia is manifested by purposeful movements, which allows corrective action to be taken promptly. As a result, awareness is unlikely, and none of our patients recalled intraoperative events. Postoperative pain was well controlled by the combination of non steroidal anti inflammatory drugs and local anesthetic infiltration; additional analgesia was rarely required. Since Fentanyl has been used as an analgesic adjuvant in both groups, there was no difference in the severity of postoperative pain in both the groups. . Both Propofol and Isoflurane seemed to be acceptable agents for spontaneously breathing anesthetized patients, allowing excellent control of the depth of anesthesia without obvious problems. Nevertheless, Propofol did result in more rapid intermediate recovery when compared to Isoflurane.

CONCLUSION

On comparing the recovery time and home readiness in Ambulatory Anaesthesia using Propofol as a Total Intravenous Venous Anaesthesia agent and inhalational maintenance technique with Isoflurane, it was found that:-

- Propofol as a sole agent had a quicker recovery
- Phase I recovery of both the groups were comparable
- Phase II recovery with Propofol TIVA was much shorter than Isoflurane maintenance anaesthesia.
- The earlier Home Readiness in TIVA using Propofol makes it more advantageous than Isoflurane maintenance in day case surgeries.

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PROFORMA

DEPARTMENT OF ANESTHESIOLOGY
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TO COMPARE THE RECOVERY TIMES OF PROPOFOL OR ISOFLURANE IN DAY CASE PROCEDURES.

S.No. **IP No:** **Date**

Name: **Age:** **Sex:**

Weight: **Allergies:**

Diagnosis:

Plan:

Co Existing Medical Illness: ( )

DM HT PT BA IHD Seizures Hypothyroid

ASA:

Preoperative Investigations:

Blood Sugar: **Blood Urea:**

Serum Creatinine: **Serum Electrolytes:**

CXR: ECG:

Airway: MPC

Premedication:

Inj Glycopyrrolate IV (5micg/Kg)

Inj Fentanyl IV (2micg/Kg)

Induction:

Propofol Initial bolus 2mg/Kg IV

Group ( )

Propofol

-12mg/Kg/h x 10min (200mcg/Kg/min)
-10mg/Kg/h x 20min (167mcg/Kg/min)
-8mg/Kg/h x 1h (133mcg/Kg/min)
-6mg/Kg/h maintenance (100mcg/Kg/min)

Isoflurane

Titrated doses

Size of LMA:

Duration of Procedure:

Time since discontinuing Propofol / Isoflurane to recovery

Phase I (Aldrete Score ≥ 9)

Phase II (PADS Score ≥ 9)